

ENVIRONMENTAL ASSESSMENT

Cooperative Gypsy Moth Project For Indiana 2011

By

**Indiana Department of Natural Resources
Division of Entomology & Plant Pathology**

**Indiana Department of Natural Resources
Division of Forestry**

**United States Department of Agriculture
Forest Service**

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Table of Contents

1.0	PURPOSE AND NEED FOR ACTION	1
1.1	Proposed Action	1
1.2	Project Objective	1
1.3	Need for Action	2
1.4	Decisions to be Made and Responsible Officials	2
1.5	Scope of the Analysis	3
1.6	Summary of Public Involvement and Notification	3
1.7	Issues Used to Formulate the Alternatives	4
1.8	Other Concerns and Questions	4
1.9	Summary of Authorizing Laws and Policies	4
2.0	ALTERNATIVES INCLUDING THE PREFERRED ALTERNATIVE	6
2.1	Process Used to Formulate the Alternatives	6
2.2	Alternatives Eliminated from Detailed Study	6
2.3	Alternatives Considered in Detail	7
2.4	Comparative Summary of Alternatives	9
3.0	AFFECTED ENVIRONMENT	10
3.1	Description of the Proposed Treatment Sites	10
3.2	Threatened and Endangered Species	15
3.3	Protection of Historic Properties	16
4.0	ENVIRONMENTAL CONSEQUENCES	17
4.1	Human Health and Safety (Issue 1)	17
4.2	Effects on Nontarget Organisms and Environmental Quality (Issue 2)	18
4.3	Economic and Political Impacts of Treatment vs. Non-Treatment (Issue 3)	20
4.4	Likelihood of Success of the Project (Issue 4)	21
4.5	Unavoidable Adverse Effects	22
4.6	Irreversible and Irretrievable Commitments of Resources	22
4.7	Cumulative Effect	22
4.8	Other Information	23
5.0	LIST OF PREPARERS	25
6.0	LIST OF PERSONS AND AGENCIES CONSULTED	26
7.0	REFERENCES CITED	28
APPENDIX A. ISSUES, QUESTIONS AND CONCERNS FROM PUBLIC INVOLVEMENT		A-1
APPENDIX B. MAPS OF PROPOSED TREATMENT SITES		B-1
APPENDIX C. AGENCY LETTERS		C-1
APPENDIX D. EXAMPLE OF PRODUCT LABELS		D-1

1.0 PURPOSE AND NEED FOR ACTION

1.1 Proposed Action

The Indiana Department of Natural Resources (IDNR), Division of Entomology & Plant Pathology and Division of Forestry, proposes a cooperative project with the United States Department of Agriculture (USDA), Forest Service (USFS) to treat the gypsy moth populations at 17 sites in 11 counties that cover an estimated 119,196 acres (Table 1 below and maps in Appendix B). The preferred alternative for the cooperative project is Alternative 5: Btk, mating disruption and/or mass trapping.

Table 1. Number of Treatment Sites and Acres by County and Treatment Method for 2011.

COUNTY	TREATMENT SITES By Treatment Method		TREATMENT ACRES By Treatment Method	
	Mating Disruption	Btk Aerial	Mating Disruption	Btk Aerial
Adams	1	0	9,441	0
Allen	0	4	0	2,408
Grant	1	0	27,140	0
Lake	0	2	0	6,488
LaPorte/Starke	1	0	1,774	0
Marshall	2	0	28,251	0
Porter	1	1	15,713	3,442
Starke	1	0	1,706	0
St. Joseph/Marshall	1	0	2,935	0
Wabash	1	0	3,087	0
Wabash/Miami	1	0	16,811	0
Proposed Cooperative Project by Treatment	10	7	106,858	12,338
Allen County Lindenwood site dropped (see Section 4.7)	0	1	0	1036
Total Cooperative Project	16		118,160	

1.2 Project Objective

The objective of this cooperative project is to slow the spread of the gypsy moth populations by eliminating reproducing populations from the proposed treatment sites. Over the past four years in Indiana, this objective has been successfully met, while implementing the Slow The Spread Program (STS) [see Tobin & Blackburn (2007) and Gypsy Moth Slow The Spread Foundation, Inc., <http://www.gmsts.org>].

1.3 Need for Action

Gypsy moth is not native to the United States, and it lacks effective natural controls. The caterpillars feed on the foliage of many host plants. Oaks are the preferred host species, but the caterpillars defoliate many species of trees and shrubs when oaks are not available. When high numbers of gypsy moth caterpillars are present, forests and trees suffer severe defoliation, which can result in reduced tree growth, branch dieback and even tree mortality. The high numbers of caterpillars also create a substantial public nuisance and can affect human health.

The State of Indiana, with the IDNR, Division of Entomology and Plant Pathology as the lead agency, is dedicated to preserving urban and rural forested habitats from damage by gypsy moth and to enforcing interstate and intrastate quarantines to further protect areas not currently infested by this pest. If no action is taken, gypsy moth will increase and spread and defoliation will occur sooner. Therefore, the "no action" alternative is not preferred due to state officials desire to eliminate the isolated infestations, prevent human discomfort associated with infestations, delay damage to local plant communities and reduce spread to adjacent non-infested areas. Through public involvement, the majority of participating citizens supported the proposed action (Appendix A).

1.4 Decisions to be Made and Responsible Officials

The preferred alternative in this document proposes cooperative participation of the IDNR and the USFS in treatment of gypsy moth populations in Indiana. The decision to be made by the responsible USFS official is to choose which of the alternatives presented in this document best meets the objective of the proposed action, and thus the needs of the people of Indiana. In addition, the decision will have to be made as to whether or not any perceived significant environmental impacts could result from the implementation of this project. If there are none, this will be documented in a Decision Notice and FONSI (Finding of No Significant Impact). If significant environmental impacts are found and the project is to continue, an Environmental Impact Statement (EIS) would be prepared.

The alternatives analyzed for this environmental assessment are:

- 1) No cooperative project (No action),
- 2) Btk,
- 3) Mating disruption,
- 4) Mass trapping,
- 5) Btk, mating disruption and/or mass trapping (Preferred Alternative).

The responsible USFS official who will make this decision is:

Barbara Tormoehlen, Field Representative, USDA, Forest Service, State and Private Forestry, Northeastern Area, 1992 Folwell Avenue, St. Paul, MN 55108, (651)-649-5276.

The responsible officials for the implementation of the cooperative project in the Indiana IDNR are:

Philip Marshall, State Entomologist, Indiana Department of Natural Resources, Division of Entomology and Plant Pathology, 402 West Washington Street, IGC South, Room W290, Indianapolis, IN 46204, (317) 232-4120.

John Seifert, State Forester, Indiana Department of Natural Resources, Division of Forestry, 402 West Washington Street, IGC South, Room W296, Indianapolis, IN 46204, (317) 232-4105.

1.5 Scope of the Analysis

A final environmental impact statement (FEIS), developed by the USDA, Animal & Plant Health Inspection Service (APHIS) and USFS, entitled Gypsy Moth Management in the United States: a cooperative approach (USDA 1995) was made available in November 1995. The Record of Decision for the FEIS was signed in January of 1996 (USDA 1996), and Alternative 6 was selected, which includes all three management strategies analyzed – suppression, eradication, and slow-the-spread. These strategies depend upon the infestation status of the area: generally infested, uninfested, and transition. Implementation of the FEIS preferred alternative requires that a site-specific environmental analysis be conducted to address local issues before federal or cooperative projects are conducted. This site-specific analysis is tiered to the programmatic environmental impact statement (USDA 1995). As part of the analyses conducted for the FEIS, human health and ecological risk assessments were prepared (Human Health Risk Assessment, Appendix F to the FEIS and Ecological Risk Assessment, Appendix G to the FEIS). The purpose of tiering is to eliminate repetitive discussions of the issues addressed in the FEIS (40 CFR, 1502.20 and 1508.28 in Council on Environmental Quality, 1992).

This environmental assessment provides a site-specific analysis of the alternatives and environmental impacts of treating gypsy moth populations for the Transition Area in Indiana.

1.6 Summary of Public Involvement and Notification

A total of 13 public meetings were held during January and February of 2011 with a total attendance of 160 individuals. (Appendix A). The public involvement notification process involved a combination method of mailings, press releases, website postings, Twitter postings, legal notices and calls. A postcard notice of the public meetings was delivered to residents living in and adjacent to the proposed treatment sites. At each meeting, state officials presented alternatives for gypsy moth management. The discussion included identification and biology of gypsy moth, pest impacts, survey methods, and treatment options. The proposed action and alternatives, including no action, were discussed. Local issues, questions and concerns stated at the public meetings and in subsequent phone calls, letters and emails are included in Appendix A.

Information gathered from the public and from resource professionals was used to develop issues and concerns related to the project. They are grouped into two categories; 1) issues used to formulate alternatives, and 2) other issues and concerns.

1.7 Issues Used to Formulate the Alternatives

Each of the major issues is introduced in this section. Discussion pertaining directly to each issue as it relates to the alternatives can be found in Chapter 4.

Issue 1 - Human Health and Safety. Three types of risk are addressed under this issue: 1) an aircraft accident during applications, 2) treatment materials and potential effects on people, and 3) the future effects of gypsy moth infestations on people.

Issue 2 - Effects on Nontarget Organisms and Environmental Quality. The major concerns under this issue are: 1) the impact of treatment materials to nontarget organisms, including threatened and endangered species that may be in the treatment sites, and 2) the future impacts of gypsy moth defoliation on the forest resources, water quality, wildlife and other natural resources.

Issue 3 - Economic and Political Impacts of Treatment vs. Non-Treatment. Gypsy moth outbreaks can have significant economic impacts due to effects on the timber resource, nursery and Christmas tree producers, and recreational activities. An additional economic impact is a gypsy moth quarantine imposed to regulate movement of products from the forest, nursery and recreational industries to uninfested areas.

Issue 4 - Likelihood of Success of the Project. The objective of this cooperative project is to slow the spread of the gypsy moth populations by eliminating reproducing populations from the proposed treatment sites. Alternatives vary in their likelihood of success for the current situation in Indiana. Measurement of project success is important for delaying gypsy moth impacts to Indiana and neighboring states.

1.8 Other Concerns and Questions

Concerns and questions were discussed during the public meetings (see Appendix A). Also, other agencies were consulted (see Appendix C). Information from these sources was used to develop management guidelines, treatment constraints, and mitigating measures.

1.9 Summary of Authorizing Laws and Policies

State. The Division Director (State Entomologist) may cooperate with a person in Indiana to locate, check, or eradicate a pest or pathogen (Indiana Code 14-24-2-1). The Division Director may, on the behalf of the department, enter into a cooperative agreement with the United States government, the government of another state, or an agency of the United States or another state to carry out this article (Indiana Code 14-24-2-2). Aerial applicators must meet Indiana Pesticide Use and Application Law (Indiana Code 15-3-3.6) to provide safe, efficient and acceptable applications of pesticides. The Non-Game and Endangered Species Conservation law (Indiana Code 14-22-34) applies to this project.

Federal. Authorization to conduct treatments for gypsy moth infestations is given in the Plant Protection Act of 2000 (7 U.S.C. section 7701 et.seq.).

The Cooperative Forestry Assistance Act of 1978 provides the authority for the USDA and state cooperation in management of forest insects and diseases. The law recognizes that the nation's capacity to produce renewable forest resources is significantly dependent on non-federal forestland. The 2008 Farm Bill (P.L. 110-246) reauthorizes the basic charter of the Cooperative Forestry Assistance Act of 1978.

The National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190), 42 USC 4321 et. seq. requires a detailed environmental analysis of any proposed federal action that may affect the human environment. The courts regard federally funded state actions as federal actions. The Federal Insecticide, Fungicide and Rodenticide Act of 1947, (7 USC 136) as amended, known as FIFRA, requires insecticides used within the United States be registered by the United States Environmental Protection Agency (EPA).

Section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531 et. seq.) prohibits federal actions from jeopardizing the continued existence of federally listed threatened or endangered species or adversely affecting critical habitat of such species.

Section 106 of the National Historical Preservation Act and 36 CFR Part 800: Protection of Historic Properties requires the State Historic Preservation Officer be consulted regarding the proposed activities.

USDA Departmental Gypsy Moth Policy (USDA 1990) assigns the USFS and APHIS responsibility to assist states in protecting non-federal lands from gypsy moth damage.

Executive Order #12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires that actions taken by Federal agencies will not result in disproportionately high and adverse human health or environmental effects on any minority or low-income populations.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Process Used to Formulate the Alternatives

Staff entomologists and administration within the IDNR, Division of Entomology and Plant Pathology and the Division of Forestry in cooperation with USDA Forest Service, formulated several alternatives to treat the gypsy moth populations in Indiana under the slow-the-spread strategies (See Chapter 6, Persons and Agencies Consulted).

The FEIS (USDA 1995), which this document is tiered to, allows the USDA to participate in the Cooperative Gypsy Moth Project for Indiana. The USDA can assist in conducting eradication, slow-the-spread and suppression strategies. The FEIS lists the treatment options for each of the strategies (USDA 1995, Vol. II, p.2-15). For the slow-the-spread strategy, the following six treatment options may be considered: 1) *Bacillus thuringiensis* var. *kurstaki* (Btk), 2) diflubenzuron (Dimilin), 3) nucleopolyhedrosis virus (Gypchek), 4) mass trapping, 5) mating disruption, and 6) sterile insect release. These treatment options from the FEIS were used as the alternatives for the site-specific analysis of this Environmental Assessment.

2.2 Alternatives Eliminated from Detailed Study

The following alternatives that are available were eliminated from consideration:

Diflubenzuron (Dimilin). The label for diflubenzuron (Dimilin) prohibits its use over wetlands and directly to water. Many treatment sites contain ponds, lakes, marsh, rivers and/or wetlands. Therefore, its use was not considered for this project. This does not preclude the consideration and use of Dimilin in future projects.

Gypsy moth specific nucleopolyhedrosis virus (Gypchek). Gypsy moth nucleopolyhedrosis virus (Gypchek) has a very limited supply and is targeted for use in special areas that have high environmental concerns (e.g., treatment sites that have threatened or endangered species, which could be impacted by other treatment options). There is limited data on the effectiveness of Gypchek in low-level gypsy moth populations. It is preferably used in suppression projects against moderate to high gypsy moth populations (USDA 1995, Vol. II, p. A7). Therefore, NPV is not considered for this project. In future projects, it will be evaluated for use.

Sterile insect release. The FEIS documents the use of sterile insects for elimination of isolated gypsy moth populations. It also documents the obstacles of using this alternative - the limited release period; need to synchronize production of sterile pupae and release into the population; and the limited availability. This treatment alternative is currently not available, and it has not been used in recent eradication or slow-the-spread treatment projects. Giving consideration to these obstacles, this alternative was not considered for this project. In future projects, it will be evaluated for use.

2.3 Alternatives Considered in Detail

Alternative 1 - No action. If no action is taken, the gypsy moth will reproduce and populations will begin to defoliate trees in the area. Gypsy moth populations will develop and spread to surrounding areas. This is not a preferred alternative because damage and regulatory action will occur sooner than if other alternatives are selected.

Alternative 2 - Btk. This treatment option uses one or two applications of Btk at 24 to 38 billion international units (BIU) per acre applied from air or ground. The applications would begin when leaf expansion is near 50% and when first and second instar caterpillars are present and feeding. This usually occurs between late April and late May in northern Indiana. The second application would follow no sooner than four days after the first application. Most commercial formulations of Btk are aqueous flowable suspension containing 48 or 76 BIU/gal. (Appendix D – example of product label). For aerial application at 24 to 38 BIU, less than 3.0 quarts of the product would be applied per acre.

Btk has been a commonly used treatment option in Cooperative Gypsy Moth Projects in Indiana and other states. Btk is a naturally occurring soil-borne bacterium that is mass-produced and formulated into a commercial insecticide. The Btk strain is effective against caterpillars, including the gypsy moth caterpillar. Caterpillars ingest Btk while eating the foliage. Once in the midgut, Btk becomes active and causes death within a few hours or days (USDA 1995, Vol. II, p. A3-A5). Btk may impact nontarget species of spring-feeding caterpillars in the treatment sites, but the impact to the local population is usually very minimal as Btk rapidly degrades on the foliage within a few weeks, and the nontarget lepidopterans generally re-colonize treatment sites in less than 2 years (USDA 1995, Vol. II, p. 4-52 to 4-55). Human exposure to Btk provides little cause for concern, though direct exposure to the spray may cause temporary eye and respiratory tract irritation in a few people (USDA 1995, Vol. II, p. 4-13).

Btk has proven effective at eliminating or reducing gypsy moth at all levels of population. Thus, Btk applications can meet the project objective of slowing the rate of spread of gypsy moth at all of the proposed treatment sites.

Alternative 3 - Mating disruption. This treatment option uses one aerial application of pheromone flakes or SPLAT (Specialized Pheromone and Lure Application Technology) with the active ingredient, disparlure, prior to the emergence of male moths. This would occur in mid-June to early July. Mating disruption relies on the attractive characteristics of disparlure, the gypsy moth sex pheromone. The objective of mating disruption is to saturate the treatment area with enough pheromone sources to confuse the male moths and prevent them from finding and mating with female moths. Mating disruption is considered specific to gypsy moth and is not known to cause impacts to nontarget organism populations, water quality, microclimate, or soil productivity and fertility (USDA 1995, Vol. II, p. 4-67).

Mating disruption using pheromone flakes involves the aerial application of plastic flake dispensers that are infused with the gypsy moth pheromone. The formulation of Disrupt II (see Appendix D – example of product labels) consists of small plastic flakes, approximately 1/32 inch x 3/32 inch (1 x 3 mm) in size, thus the name “pheromone flakes”. A sticker, Monsanto's

Gelva 2333, is applied to the flakes as they are dispersed from the aircraft, which aids in the distribution of the flakes throughout all levels in the forest canopy where mating could potentially occur. The flakes are green in color and applied at a rate of 6 or 15 grams active ingredient (disparlure) per acre. At the high rate of 15 grams, 85 grams of flakes are applied in 2 fluid ounces of sticker per acre (2 flakes per sq.ft.) (Thorpe et al. 2006). All of the ingredients in the Gelva 2333 sticker are considered non-hazardous to public health if used as an additive in the insecticide formulation (40 CFR 180.1001).

Mating disruption using SPLAT involves the aerial application of amorphous polymer matrix droplets that are infused with the gypsy moth pheromone. The formulation of SPLAT consists of small waxy droplets, approximately 0.3 mm to 2.0 mm in size when released from a conventional aerial application system. The droplets are a grayish white in color and applied at a rate of 3 grams to 30 grams of active ingredient (disparlure) per acre (see Appendix D – example of product labels). Applications would most commonly be applied at a rate of either 6 or 15 grams (equivalent of approximately 1.2 teaspoons or 3.0 teaspoons) of pheromone per acre. All of the matrix ingredients are cleared as food safe by the FDA and biodegradable.

Mating disruption has proven effective at eliminating or reducing gypsy moth at very low population levels for sites greater than 40 acres, and can meet the project objective of slowing the rate of spread of gypsy moth at ten of the proposed treatment sites.

Alternative 4 - Mass trapping. This treatment option places gypsy moth traps at a close spacing within the treatment sites. “The objective of this treatment is to capture male gypsy moths before they have a chance to locate and mate with female moths.” (USDA 1995, Vol. II, p. A-7). “For mass trapping, delta or milk carton traps are deployed in an intensive grid pattern in an infested area and an adjacent buffer area at the rate of at least nine traps per acre” (USDA 1995, Vol. II, p. A-8). Thus, it is very labor intensive, especially over large areas. Typically, mass trapping is used on small infestations of less than 40 acres.

Mass trapping has proven capable of eliminating or reducing gypsy moth at very low population levels in isolated introductions for sites less than 40 acres. The use of mass trapping cannot meet the projective objective of slowing the rate of spread of gypsy moth at any of the proposed treatment sites.

Alternative 5 - Btk, Mating disruption and/or Mass trapping (Preferred Alternative). The use of this alternative provides flexibility to select Btk, mating disruption, or mass trapping alone or in combination for each site based on the following criteria: 1) gypsy moth population level, 2) habitat type (urban, rural, open water or wetland), 3) nontarget organisms, 4) safety and 5) cost and project efficiency. The use of this alternative can meet the objective of slowing the spread of gypsy moth at all of the proposed treatment sites.

2.4 Comparative Summary of Alternatives

Table 2. Summary of Environmental Consequences for Alternatives by Issues from Chapter 4.

	Issue 1 Human Health & Safety (pgs. 17-18)	Issue 2 Effects on Nontarget Organisms & Environmental Quality (pgs. 18-20)	Issue 3 Economic and Political Impacts (pgs. 20-21)	Issue 4 Likelihood of Success of the Project (pgs. 21-22)
Alternative 1 No action	<ul style="list-style-type: none"> - No risk of an aircraft accident or spill. - No risk of Btk contact with humans. - Gypsy moth outbreaks will occur sooner along with the associated nuisance and health impacts to humans. 	<ul style="list-style-type: none"> - No direct effect to nontarget organisms, including threatened and endangered species. - Future gypsy moth impacts will occur sooner, which includes defoliation and reduction in the oak component of forest stands. 	<ul style="list-style-type: none"> - Regulatory action would occur sooner. - Spread of gypsy moth through these counties and into adjacent counties would not be slowed. - Suppression projects and negative financial impacts from defoliation would occur sooner. 	<ul style="list-style-type: none"> - The spread of gypsy moth would not be slowed at the treatment sites and the project objective would not be met.
Alternative 2 Btk	<ul style="list-style-type: none"> - Slight risk of aircraft accident and pesticide spill. - Contact with Btk may cause mild and temporary irritation (eye, skin & respiratory) to a few people. - Delay effect of gypsy moth outbreaks on humans. 	<ul style="list-style-type: none"> - Direct impact on spring feeding caterpillars, temporary reduction in local populations. - Unlikely effect on Karner blue butterfly and Mitchell's satyr as neither species is known to occur in close proximity to proposed treatment sites. - Adverse effect on Indiana bat, clubshell mussel, fanshell mussel, copperbelly water snake, sheepnose mussel, rayed bean mussel, eastern massasauga rattlesnake and bald eagle is unlikely. - Delay the impact of gypsy moth defoliation on environmental quality. 	<ul style="list-style-type: none"> - Regulatory action would not be implemented in these counties during the current year. - Slows the spread of gypsy moth. 	<ul style="list-style-type: none"> - Success is likely in the treatment sites.
Alternative 3 Mating disruption	<ul style="list-style-type: none"> - Slight risk of aircraft accident. - No effect to human health. - Delay effect of gypsy moth outbreaks on humans. 	<ul style="list-style-type: none"> - No effect to nontarget organisms, including threatened and endangered species known to occur within the site - Delay the impact of gypsy moth defoliation on environmental quality. 	<ul style="list-style-type: none"> - Regulatory action would not be implemented in these counties during the current year. - Slows the spread of gypsy moth. 	<ul style="list-style-type: none"> - Success is likely in treatment sites with very low populations. -
Alternative 4 Mass trapping	<ul style="list-style-type: none"> - No risk of aircraft accident or spill. - No risk of Btk contact with humans - No effect to human health - Delay effects of gypsy moth outbreaks on humans. 	<ul style="list-style-type: none"> - No effect to nontarget organism including, threatened and endangered species known to occur within the site. - Delay the impact of gypsy moth defoliation on environmental quality. 	<ul style="list-style-type: none"> - Regulatory action would not be implemented in these counties during the current year. - Slows the spread of gypsy moth. - Cost is prohibitive in large treatment sites. 	<ul style="list-style-type: none"> - Success is likely in treatment sites with very low populations.
Alternative 5 Btk, Mating disruption and mass trapping	<ul style="list-style-type: none"> - Same as alternative 2, 3 or 4 depending on the treatment at each site. 	<ul style="list-style-type: none"> - Same as alternative 2, 3 or 4 depending on the treatment at each site. 	<ul style="list-style-type: none"> - Regulatory action would not be implemented in these counties during the current year. - Slows the spread of gypsy moth. 	<ul style="list-style-type: none"> - Success is likely in the treatment sites.

3.0 AFFECTED ENVIRONMENT

3.1 Description of the Proposed Treatment Sites

Adams County: There are approximately 216,979 acres in Adams County. Of the 9,441 total acres of assessed land area for proposed treatment in this county, only tree canopy within 1098 acres will be treated. This is approximately 12% of the total assessed area and a small portion of the total acres in this county.

Wren: The proposed treatment site contains 9,441 acres. The site is composed of trees associated with rural residences and woodlots. Oak, hickory, walnut, maple, ash, basswood, sycamore, cottonwood, crabapple, hawthorn, spruce, pine and other hardwoods and shrubs are present. Houses, businesses, and churches occur within the site. St. Mary's River runs through the south and west areas of the site. Several streams, ponds and Yellow Creek occur within the site. A cell phone tower and radio tower occur within the site. The site was detected in 2010 and has had no prior treatment. No egg masses were detected in this site in 2010. Survey indicates a very low gypsy moth population, and mating disruption is proposed for this site.

Allen County: There are approximately 420,594 acres in Allen County. Of the 2,408 total acres of assessed land area for proposed treatment in this county, only tree canopy within 518 acres will be treated. This is approximately 22% of the total assessed area and a small portion of the total acres in this county. The Lindenwood site was assessed, but dropped from the cooperative project and is not included in this percentage.

Bremer Road 11: The proposed treatment site contains 41 acres. The site is composed of trees associated with rural residences and woodlots. Oak, hickory, maple, basswood, elm, pine and other hardwoods and shrubs are present. Four houses occur within the site. No areas of environmental concern, water, schools or aerial hazards have been identified within the site. The site was detected in 2010 and has had no prior treatment. Several egg masses were detected in this site in 2010. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Hadley Road 11: The proposed treatment site contains 970 acres. The site is composed of trees associated with urban residences and woodlots. Oak, hickory, beech, maple, pine, spruce, crabapple, cottonwood, willow, ash and other hardwoods and shrubs are present. Houses, schools, churches and businesses occur within the site. A wetlands area and several ponds occur within the site. Several streams and drainage ditches occur within the site, with at least one stream draining into the Wabash River. A cell phone tower, water tower, power lines, tall billboards, factory radio antenna along I-69, electric substation antenna and I-69 interstate exchange lighting occur within the site. The site was detected in 2010 and has had no prior treatment. One egg mass was detected in this site in 2010. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Kroemer Road 11: The proposed treatment site contains 361 acres. The site is composed of trees associated with both rural and urban residences and woodlots. Oak, hickory, maple, ash, basswood, crabapple, pine, spruce and other hardwoods and shrubs are present. Houses, businesses, and Coyote Creek Golf Club occur within the site. No churches or schools occur within the site. Ponds occur within the site. Radio towers and power lines occur within the site. The site was detected in 2010 and has had no prior treatment. Several egg masses were detected in this site in 2010. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Lindenwood 11: The proposed treatment site contains 1036 acres. The site is composed of trees associated with urban residences and woodlots. Oak, maple, cherry, walnut, cottonwood, sycamore, basswood, ash, locust, crabapple, hackberry, beech, spruce, hemlock, bald cypress, pine and other hardwoods and shrubs are present. Houses, businesses, churches, schools and Lindenwood Cemetery occur within the site. University of St. Francis occurs adjacent to the north boundary of the site. Several parks (Swinney Park has a swimming pool) and Lindenwood Nature Preserve occur within the site. Ponds and drainage ditches (including Junk Ditch) occur within the site. St. Mary's River runs through the eastern area of the site. Several communications towers, a cell tower, power lines and tall buildings occur within the site. The site was detected in 2008 and delimited in 2009 and 2010. Part of the site was treated with Btk in 2009 and 2010. Several egg masses were detected in this site in 2010. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Grant County: There are approximately 265,016 acres in Grant County. Of the 27,140 total acres of the assessed land area for proposed treatment in this county, only tree canopy within 5289 acres will be treated. This is approximately 19% of the total assessed area and a small portion of the total acres in this county.

Upland: The proposed treatment site contains 27,140 acres. The site is composed of trees associated with rural residences and woodlots. Oak, maple, basswood, sycamore, hickory, cherry, beech, ash, locust, spruce, pine and other hardwoods and shrubs are present. Houses, businesses, churches, schools, Taylor University and Ivy Tech Community College occur within the site. Walnut Creek Golf Course and Sports Lake Campground occur within the site. Several ponds, creeks and lakes occur within the site. Miller Purdue Agricultural Center is located on the east boundary of the assessed site. Power lines, water towers, cell towers, radio towers, tall business signs and football stadium lights occur within the site. The site was detected in 2010 and has had no prior treatment. No egg masses were detected in this site in 2010. Survey indicates a very low gypsy moth population, and mating disruption is proposed for this site.

Lake County: There are approximately 317,990 acres in Lake County. Of the 6,488 total acres of assessed land area for proposed treatment in this county, only tree canopy within 801 acres will be treated. This is approximately 12% of the total assessed area and a small portion of the total acres in this county.

Highland: The proposed treatment site contains 5,780 acres. The site is composed of trees associated with urban residences and woodlots. Oak, ash, maple, beech, cherry and other hardwoods and shrubs are present. Houses, businesses, schools, Wicker Park and Golf Course and Woodmar Country Club and Golf Course occur within the site. A water filtration plant and pumping station occur within the site. Eleven or more parks occur within the site. A small area of native prairie occurs in the northeast area of the site. Hoosier Prairie State Nature Preserve occurs just outside the southeast boundary of the site. The Calumet River runs through the northern area of the site and several drainage ditches and ponds occur within the site. Munster Community Hospital (with emergency helipad) occurs within the site. Cell towers and power lines occur within the site. The site was detected in 2010 and has had no prior treatment. Egg masses were detected in this site in 2010. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Springrose Heath: The proposed treatment site contains 708 acres. The site is composed of trees associated with both urban and rural residences and woodlots. Oak, maple, crabapple, ash, honeylocust and other hardwoods and shrubs are present. Houses and a Christmas tree farm occur within the site. Several ponds and lakes occur within the site. Power lines, a water tower, several cell towers and an electric substation with towers occur within the site. The site was detected in 2010 and has had no prior treatment. Egg masses were detected in this site in 2010. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

LaPorte/Starke Counties: There are approximately 382,905 acres in LaPorte County and approximately 198,045 acres in Starke County. Of the 1,774 total acres of assessed land area for this proposed treatment site, only tree canopy within 565 acres will be treated. This is approximately 32% of the total assessed area and a small portion of the total acres in these two counties.

Bigler Road: The proposed treatment site contains 1,774 acres. The site is composed of trees associated with rural residences and woodlots. Oak, maple, hickory, cherry and other hardwoods and shrubs are present. Houses occur within the site. Kankakee River and Origer Ditch and several lakes occur within the site. A cell tower is adjacent to the site. The site was detected in 2010 and has had no prior treatment. No egg masses were detected in this site in 2010. Survey indicates a very low gypsy moth population and, mating disruption is proposed for this site.

Marshall County: There are approximately 283,923 acres in Marshall County. Of the 28,251 total acres of assessed land area for the proposed treatment sites, only tree canopy within 10,329 acres will be treated. This is approximately 37% of the total assessed area and a small portion of the total acres in this county.

Plymouth: The proposed treatment site contains 28,101 acres. The site is composed of trees associated with both urban and rural residences and woodlots. Oak, elm, maple, hickory, ash, spruce, pine and other hardwoods and shrubs are present. Houses, businesses, churches, Plymouth Country Club, Plymouth Rock Golf Course, Jelly Stone

Campground and a Boy Scouts of America Campground occur within the site. Schools occur within and adjacent to the site. Menominee State Wetlands Conservation Area and several wetlands (mostly around lakes in southern area of the site) occur within the site. Several lakes, ponds and drainage ditches occur within the site. Yellow River and Harry Cool Ditch run through the site. St. Joseph Regional Medical Center (no helipad) occurs within the site. Plymouth Municipal Airport occurs adjacent to the southeast of the site. Several communications towers and power lines occur within and adjacent to the site. The site was detected in 2010 and has had no prior treatment. No egg masses were detected in this site in 2010. Survey indicates a very low gypsy moth population, and mating disruption is proposed for this site.

Tamarack Road: The proposed treatment site contains 150 acres. The site is composed of trees associated with rural residences and woodlots. Oak, maple, cherry and other hardwoods and shrubs are present. Houses and businesses occur within the site. No schools, churches, hospitals or airports occur within the site. A wet ditch runs through the site. No other environmental concerns or aerial hazards were identified. The site was detected in 2010 and has had no prior treatment. No egg masses were detected in this site in 2010. Survey indicates a very low gypsy moth population, and mating disruption is proposed for this site.

Porter County: There are approximately 267,639 acres in Porter County. Of the 19,155 total acres of assessed land area for proposed treatment in this county, only tree canopy within 9,242 acres will be treated. This is approximately 48% of the total assessed area and a small portion of the total acres in this county.

350 East: The proposed treatment site contains 15,713 acres. The site is composed of trees associated with both urban and rural residences and woodlots. Oak, maple, cherry, walnut, elm, ash, willow, spruce and other hardwoods and shrubs are present. Houses, mobile home parks, businesses, schools, and Mink Lake Golf Course occur within the site. Coffee Creek, Johnson Ditch and several ponds and lakes occur within the site. Moore Swamp and Hungry Hollow connect to Coffee Creek near the south central area of the site. Several areas of natural water springs occur within the site. Sunset Hills County Park, Bicentennial Park and other parks occur within the site. A power line and radio towers occur within the site. The site was detected in 2010 and has had no prior treatment. No egg masses were detected in this site in 2010. Survey indicates a very low gypsy moth population and, mating disruption is proposed for this site.

350 East Core: The proposed treatment site contains 3,442 acres. The site is composed of trees associated with rural residences and woodlots. Oak, cherry, maple, elm, ash and other hardwoods and shrubs are present. Houses occur within the site. Moraine State Nature Preserve, Coffee Creek, Carlson Pond and several other small ponds occur within the site. No schools or parks occur within the site. A power line occurs within the site. The site was detected in 2010 and has had no prior treatment. Egg masses were detected in this site in 2010. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Starke County: There are approximately 198,045 acres in Starke County. Of the 1,706 total acres of assessed land area for the proposed treatment site, only tree canopy within 957 acres will be treated. This is approximately 56% of the total assessed area and a small portion of the total acres in this county.

Koontz Lake: The proposed treatment site contains 1,706 acres. The site is composed of trees associated with rural residences and woodlots. Oak, cherry, maple, ash, pine and other hardwoods and shrubs are present. Houses and businesses occur within the site. No schools occur within the site. Tree conservation plantings and Christmas tree farms occur within the site. A few ponds and Robbins Ditch occur within the site. No aerial hazards were identified within the site. The site was detected in 2010 and has had no prior treatment. No egg masses were detected in this site in 2010. Survey indicates a very low gypsy moth population, and mating disruption is proposed for this site.

St. Joseph/Marshall Counties: There are approximately 293,000 acres in St. Joseph County and approximately 283,923 acres in Marshall County. Of the 2,935 total acres of assessed land area for the proposed treatment site, only tree canopy within 1,820 acres will be treated. This is approximately 62% of the total assessed area and a small portion of the total acres in these two counties.

Walkerton: The proposed treatment site contains 2,935 acres. The site is composed of trees associated with rural residences and woodlots. Oak, elm, hickory, maple, ash, spruce, pine and other hardwoods and shrubs are present. Houses and businesses occur within the site. No schools occur within the site. Tree conservation plantings occur within the site. Yellow Bank Creek, drainage ditches and a lake occur within the site. Hop's Powered Parachutes and associated grass air runway occur within the site. The site was detected in 2010 and has had no prior treatment. No egg masses were detected in this site in 2010. Survey indicates a very low gypsy moth population, and mating disruption is proposed for this site.

Wabash County: There are approximately 263,868 acres in Wabash County. Of the 3,087 total acres of assessed land area for this proposed treatment site, only tree canopy within 553 acres will be treated. This is approximately 18% of the total assessed area and a small portion of the total acres in this county.

Mississinewa North: The proposed treatment site contains 3,087 acres. The site is composed of trees associated with both rural and urban residences and woodlots. Oak, hickory, walnut, maple, beech, tulip poplar, basswood, sycamore, cottonwood, ash, dogwood, pine, spruce and other hardwoods and shrubs are present. Houses, businesses and a church occur within the site. No schools occur within the site. Several creeks occur within the site; including Engleman Creek, Carlin Branch and Keniner Creek, which all drain into the Wabash River. A cell tower occurs within the site and a radio tower occurs adjacent to the site. The site was detected in 2010 and has had no prior treatment. No egg masses were detected in this site in 2010. Survey indicates a very low gypsy moth population, and mating disruption is proposed for this site.

Wabash/Miami Counties: There are approximately 263,868 acres in Wabash County. There are approximately 239,259 acres in Miami County. Of the 16,811 total acres of assessed land area for this proposed treatment site, only tree canopy within 5,633 acres will be treated. This is approximately 34% of the total assessed area and a small portion of the total acres in these two counties.

Mississinewa South: The proposed treatment site contains 16,811 acres. The site is composed of trees associated with urban residences and woodlots. Oak, hickory, maple, beech, tulip poplar, basswood, ash, cottonwood, dogwood, sycamore, spruce, pine and other hardwoods and shrubs are present. Houses, businesses, a church and a school occur within the site. The Mississinewa Lake and River occurs within the site. Seven Pillars Nature Preserve (Acres Land Trust) occurs within the site. Asherwood Nature Preserve occurs within the site. An area of approximately 37 acres of Miami Nation of Indians of the State of Indiana lands occur within the site. Frances Slocum State Forest occurs within the site. Ponds and several creeks that drain into the Wabash River occur within the site. The Mississinewa Lake (Reservoir) Dam and control tower occurs within the site. A water tower, radio towers and power lines occur within the site. The site was detected in 2010 and has had no prior treatment. No egg masses were detected in this site in 2010. Survey indicates a very low gypsy moth population, and mating disruption is proposed for this site.

3.2 Threatened and Endangered Species

Consultation with the staff of the U.S. Fish and Wildlife Service determined that, “One of the proposed treatment methods, spraying with *Bacillus thuringiensis* (Btk), is of concern for 2 federally endangered species of Lepidoptera in Indiana, the Karner blue butterfly (*Lycaeides melissa samuelis*) and Mitchell’s satyr butterfly (*Neonympha mitchellii*). The known occurrences of these 2 endangered species are in the northern portions of Lake and Porter Counties (Karner blue butterfly), and isolated locations in LaPorte and LaGrange Counties (Mitchell’s satyr).” (Appendix C – Letter from U.S. Fish & Wildlife Service).

“Neither species is known to occur in close proximity to any of the Btk treatment sites identified in your letter. One Btk treatment site in Lake County (Highland block – 5780 acres) is within 3 miles of a Karner blue butterfly population. That block is also in the vicinity of Indiana state nature preserves that support state-endangered or rare butterflies (including Hoosier Prairie State Nature Preserve, where Karner blue butterflies previously occurred but are no longer extant). To avoid any potential for adverse impacts to rare butterflies we recommend that aerial treatment in that area be limited to mating disrupters. However, if aerial treatment is implemented to avoid drift to the Karner blue butterfly area (northward), we concur that the project is not likely to adversely affect this species.” (Appendix C – Letter from U.S. Fish & Wildlife Service). The U.S. Fish and Wildlife Service also evaluated the proposed sites for other endangered and threatened species. It was determined that the proposed treatments would not have an impact on the Indiana bat (*Myotis sodalis*), clubshell mussel (*Pleurobema clava*), fanshell mussel (*Cyprogenia stegaria*), copperbelly water snake (*Nerodia erythrogaster neglecta*) and two species proposed for federal listing, the sheepsnout mussel (*Plethobasus cyphus*) and rayed bean mussel (*Villosa fabalis*) (Appendix C – Letter from U.S. Fish & Wildlife Service).

“The Mississinewa South block contains a major bald eagle wintering area and is near an eagle nest. We do not anticipate adverse impacts on the nest from pheromone treatments.” (Appendix C – Letter from U.S. Fish & Wildlife Service).

“The FWS concludes that the federally assisted 2011 gypsy moth program is not likely to adversely affect any of these federally listed or proposed species.”(Appendix C – Letter from U.S. Fish & Wildlife Service).

The IDNR, Environmental Unit reviewed the project and determined, “At this time, no harm to state or federal listed species resulting from the proposed control measures is known or anticipated. The potential harm from the project is less than the potential harm to these same species from an uncontrolled gypsy moth infestation. Time the application of Btk to maximize its effects on gypsy moth caterpillars.”(Appendix C – Letter from IDNR Div. of Fish and Wildlife, Early Coordination/Environmental Assessment).

3.3 Protection of Historic Properties

The State Historic Preservation Officer did not identify any historic properties that will be altered, demolished, or removed by the proposed project pursuant to Indiana Code 14-21-1-18. (Appendix C –Letter from IDNR, Division of Historic Preservation and Archaeology).

4.0 ENVIRONMENTAL CONSEQUENCES

This section is the scientific and analytic basis for the comparison of alternatives. It describes the probable consequences (effects) of each alternative for each issue. Environmental consequences are summarized in Table 2 for each combination of the alternatives and issues.

4.1 Human Health and Safety (Issue 1).

Alternative 1 – No action. For this alternative, there would be no cooperative project, therefore risk of human contact with mating disruption or Btk and an aircraft accident during application would not exist. However, future impacts by gypsy moth to human health will occur sooner under Alternative 1 than if treatments are used to slow-the-spread of these gypsy moth populations. Gypsy moth outbreaks have been associated with adverse human health effects, including skin lesions, eye irritation, and respiratory reactions. Gypsy moth caterpillars can become a serious nuisance that can cause psychological stress in some individuals (USDA 1995, Vol. II, p. 4-9).

Alternative 2 - Btk. Human exposure to Btk provides little cause for concern about health effects. “On the basis of both the available epidemiology studies as well as the long history of use, no hazard has been identified for members of the general public exposed to Btk formulations” (USDA 1995, Vol. III, p. 4-15). Exposure to Btk may result in temporary eye, skin, and respiratory tract irritation in a few people. A detailed analysis of the risks posed to humans by Btk was conducted for the FEIS -- Human Health Risk Assessment (USDA 1995, Vol. III). Glare and O’Callaghan provide a comprehensive review of *Bacillus thuringiensis*, including Btk. They conclude with this statement, “After covering this vast amount of literature, our view is a qualified verdict of safe to use.” (Glare and O’Callaghan, 2000)

A slight risk of an accident always exists when conducting aerial applications – Btk uses one or two applications. To further reduce this risk, a detailed work and safety plan is required prior to program implementation, which outlines guidelines for aircraft inspections, Btk loading, and conditions for safe applications.

The effect of gypsy moth outbreaks on humans would be delayed using this alternative.

Alternative 3 – Mating disruption. The toxicity of insect pheromones to mammals is relatively low and their activity is target-specific. Therefore the EPA requires less rigorous testing of these products than of conventional insecticides. Risk to human health due to exposure to disparlure, the active ingredient used in mating disruption applications, is discussed in the FEIS (USDA 1995, Vol. II, pp. 4-30 to 4-32). Once absorbed through direct contact, disparlure is very persistent in humans, and individuals exposed to disparlure may attract adult male moths for prolonged periods of time. This persistence is viewed as a nuisance and not a health risk (USDA 1995, Vol. III, 8-1). In acute toxicity tests, disparlure was not toxic to mammals, birds, or fish (USDA 1995, Vol. IV, 5-5) therefore no effects to human health are anticipated.

A slight risk of an accident always exists when conducting aerial applications – mating disruption uses one application. To further reduce this risk, a detailed work and safety plan is

required prior to program implementation, which outlines guidelines for aircraft inspections, product loading, and conditions for safe applications.

The effect of gypsy moth outbreaks on humans would be delayed using this alternative.

Alternative 4 – Mass trapping. The effect of gypsy moth outbreaks on humans would be delayed using this alternative. The human health effects are not anticipated from the use of disparlure in the delta traps (see Alternative 3 above).

Alternative 5 – Btk, Mating disruption, and Mass trapping. The human health and safety consequences stated above for Alternatives 2, 3 and 4 apply to this alternative.

4.2 Effects on Nontarget Organisms and Environmental Quality (Issue 2).

Alternative 1 – No action. With no treatments in the current year, future impacts by the gypsy moth would occur sooner. Defoliation by the gypsy moth will cause selective mortality of preferred host trees. During outbreaks, forest ecosystems can change due to a reduction of the oak component and an increase of tree species that are less desired by gypsy moth, such as maple and ash. Oak forests would likely consist of a more mixed composition in the future; though oak would still be a component.

Gypsy moth defoliation and subsequent tree mortality can affect nontarget organisms by dramatically changing habitats on a local scale. Heavy defoliation can remove food for other leaf-feeding species, including other caterpillars. However, it can also create new habitat for some species by creating snags and increasing understory plant development by increasing light penetration into defoliated areas. Impacts on a larger scale (national, regional, or state) are subtle, gradual, and may be noticeable only after many years or decades (USDA 1995, Vol. II, p. 4-74). Short- and long-term changes in nontarget species have been shown for moderate and heavy defoliation (USDA 1995, Vol. II, p. 4-47 and 4-50). An Ecological Risk Assessment (USDA 1995, Vol. IV) examined gypsy moth impacts on a wide variety of species (mammals, birds, reptiles, amphibians, fish, insects, mollusks, crustaceans, and other invertebrates). Further discussion of gypsy moth and its impact on forest conditions can be found in the FEIS (USDA 1995, Vol. II, p. 4- 41 and 4-74).

Alternative 2 - Btk. Btk can have direct and indirect effects on nontarget organisms. Direct toxicity of Btk is generally limited to the larval stage of moth and butterfly species. Btk is not toxic to vertebrates, honeybees, parasitic and predatory insects, and most aquatic invertebrates (USDA 1995, Vol. IV, p. 5-1). Btk has a direct adverse effect on caterpillars of moths and butterflies, but susceptibility varies widely among species. Btk, as used in gypsy moth projects, poses a risk to some spring-feeding caterpillars; however, permanent changes in their populations do not appear likely. An exception may occur in certain habitats that support small isolated populations of a particular species of moth or butterfly that is highly susceptible to Btk (USDA 1995, Vol. II, p. 4-54). The U.S. Fish and Wildlife Service identified two federally endangered butterflies of concern, Karner blue butterfly (*Lycaeides melissa samuelis*) and the Mitchell's satyr butterfly (*Neonympha mitchellii*). "Neither species is known to occur in close proximity to any of the Btk treatment sites identified in your letter. One Btk treatment site in

Lake County (Highland block – 5780 acres) is within 3 miles of a Karner blue butterfly population. That block is also in the vicinity of Indiana state nature preserves that support state-endangered or rare butterflies (including Hoosier Prairie State Nature Preserve, where Karner blue butterflies previously occurred but are no longer extant). To avoid any potential for adverse impacts to rare butterflies we recommend that aerial treatment in that area be limited to mating disrupters. However, if aerial treatment is implemented to avoid drift to the Karner blue butterfly area (northward), we concur that the project is not likely to adversely affect this species.” (Appendix C – Letter from U.S. Fish & Wildlife Service).

Btk may have an indirect effect on other organisms by a reduction in their food resource (e.g. caterpillars, pupae, or adult moths and butterflies). Any effects on vertebrates due to reduction in food availability are probably subtle, especially for mammals and birds that are very mobile. Populations of some gypsy moth parasites and some general lepidopteran parasites may be reduced, due to the reduction in number of potential hosts caused by the Btk spray (USDA 1995, Vol. IV, p. 5-7).

The U.S. Fish and Wildlife Service also evaluated the proposed sites for other endangered and threatened species. It was determined that the proposed treatments would not have an impact on the Indiana bat (*Myotis sodalis*), clubshell mussel (*Pleurobema clava*), fanshell mussel (*Cyprogenia stegaria*), copperbelly water snake (*Nerodia erythrogaster neglecta*) and two species proposed for federal listing, the sheepsnout mussel (*Plethobasus cyphus*) and rayed bean mussel (*Villosa fabalis*) (Appendix C – Letter from U.S. Fish & Wildlife Service).

“The FWS concludes that the federally assisted 2011 gypsy moth program is not likely to adversely affect any of these federally listed or proposed species.” (Appendix C – Letter from U.S. Fish & Wildlife Service).

Applications of Btk formulations do not increase levels of Btk in soil, and Btk persists for a relatively short time in the environment. Changes in soil productivity and fertility are not likely in the treatment sites, because Btk occurs naturally in soils worldwide. Additional information concerning the effects to soil can be found in Appendix G of the FEIS (USDA 1995, Vol. IV).

Application of Btk is likely to maintain the forest condition in the short-term by eliminating or reducing gypsy moth populations in the treatment sites, thus delaying gypsy moth from expanding and causing defoliation. In the long-term, gypsy moth will become well established in these counties; even if this alternative is implemented.

Alternative 3 – Mating disruption. The pheromone, disparlure, is highly specific to gypsy moth, and it will not affect other insects, including any threatened and endangered species of butterflies or moths.

A quantitative assessment of risk from mating disruption was not conducted for the FEIS because of disparlure’s low toxicity to vertebrates and specificity to gypsy moth. As used in mating disruption, disparlure is not likely to impact nontarget organisms (USDA 1995, Vol. II, p. 4-67). The toxicity of insect pheromones to mammals is relatively low. In acute toxicity tests, disparlure was not toxic to mammals, birds, or fish (USDA 1995, Vol. IV, 5-5). At normal

application rates, concentration of the pheromone (disparlure) in the mating disruption products remains active for the season. Therefore, no effects on nontarget organisms are anticipated from the proposed mating disruption application.

The U.S. Fish and Wildlife Service determined that mating disruption pheromone treatments would not have adverse effects on mussels, reptiles and bald eagle wintering and nesting areas.

“The FWS concludes that the federally assisted 2011 gypsy moth program is not likely to adversely affect any of these federally listed or proposed species.” (Appendix C – Letter from U.S. Fish & Wildlife Service).

Using mating disruption is likely to maintain the forest condition in the short-term by eliminating or reducing gypsy moth populations in the treatment sites, thus delaying gypsy moth from expanding and causing defoliation. In the long-term, gypsy moth will become well established in these counties; even if this alternative is implemented.

Alternative 4 - Mass trapping. The pheromone in the delta trap is highly specific to gypsy moth and will not have an effect on other insects or threatened and endangered species of butterflies or moths. “Mass trapping does not affect nontarget organisms, except those (primarily flying insects) that accidentally find their way into the trap.” (USDA 1995, Vol. II, p. A-9)

Mass trapping is likely to maintain the forest condition in the short-term by eliminating or reducing gypsy moth populations in the treatment sites, thus delaying gypsy moth from expanding and causing defoliation. In the long-term, gypsy moth will become well established in these counties; even if this alternative is implemented.

Alternative 5 - Btk, Mating disruption, and Mass trapping. The nontarget and environmental consequences stated above for Alternatives 2, 3 and 4 apply to this alternative.

4.3 Economic and Political Impacts of Treatment vs. Non-Treatment (Issue 3).

Alternative 1 – No action. If no treatments were applied, the likely action would be to implement a quarantine in these counties during the next year. A quarantine would regulate movement of firewood, logs, other timber products, mobile homes, recreational vehicles, trees, shrubs, Christmas trees, and outdoor household articles. This would create a financial impact to industries that deal with these products.

If current populations are not treated, they will continue to reproduce and grow in size. Defoliation would become noticeable in the future, but it would be difficult to predict exactly when noticeable defoliation would occur. Requests for federal assistance to suppress gypsy moth would be likely when defoliation occurs. Suppression projects are generally more expensive in total dollars than eradication projects because much larger areas are treated. The economic impact to state budgets would increase, as responsible agencies would need to administer and fund these suppression projects.

Following defoliation, negative financial impacts are likely to occur for recreational industries such as resorts and campgrounds. Homeowners, private woodland owners, and forest-based industries could be impacted by gypsy moth treatment costs, tree mortality, and adverse human health effects.

Alternative 4 – Mass trapping. If treatments are applied, regulatory action is not likely for these counties during the next year and the impacts listed under Alternative 1 would be delayed. Mass trapping is typically used in small areas (less than 40 acres) because it is labor intensive (USDA 1995, Vol. II, p. A8-9). At a rate of approximately \$180.00 per acre, its use for all treatment sites would be cost prohibitive (versus approximately only \$20.00-\$40.00 per acre for Btk or approximately \$8.00-\$15.00 per acre for mating disruption).

Alternatives 2 (Btk), 3 (Mating disruption), and 5 (Btk, Mating disruption, and Mass trapping). If treatments are applied, regulatory action is not likely for these counties during the next year and the impacts listed under Alternative 1 would be delayed. Economic analysis from the Slow-The-Spread Program (STS) demonstrated the use of Btk, mating disruption and other STS technology reduced the spread of gypsy moth by as much as 60 percent (Sharov et al. 2002, p. 32). For a 20 year period from 2006-2026, the total cost of the STS program will be in the range of \$150 to \$195 million. The total benefits during this 20 year time period are at least \$488 million. This includes \$163 million in postponed suppression costs, and \$325 million in postponed residential impacts. Over a 20 year period, the Benefit-Cost Ratio is 2.5, under conservative assumptions (Sills 2007).

4.4 Likelihood of Success of the Project (Issue 4).

Alternative 1 – No action. Project objectives would not be met with this alternative. Gypsy moth would not be eliminated at any level from the treatment sites, and its population would serve as a source for increased spread within the counties and into surrounding counties. If these populations were allowed to increase and expand, gypsy moth could spread through the state in 10 years (Sharov et al. 2002).

Alternative 2 - Btk. Project success is likely with this alternative. Btk has proven effective at eliminating or reducing gypsy moth at all levels of population.

Alternative 3 – Mating disruption. Project success is likely with this alternative in 10 treatment sites with very low gypsy moth populations. However, seven sites have gypsy moth populations above the recommended level for treatment with mating disruption.

Alternative 4 – Mass trapping. Mass trapping can be successful in treatment sites with very low gypsy moth populations. However, mass trapping is a labor-intensive treatment and sites greater than 40 acres are usually not mass trapped due to cost.

Alternative 5 - Btk, Mating disruption, and Mass trapping. Project success is optimized with this alternative when treatment selection criteria are used to determine the use of Btk, mating disruption or mass trapping alone or in combination for each site. From the data analysis by the STS Program, the average rate of spread in Indiana during 2007-2010 was calculated to be 5.3

miles per year. Over the past 4 years, the leading edge of gypsy moth populations (as defined by the 10-moth line) has been only slightly short of the suggested goal of 4.8 miles/year in Indiana while implementing the Slow The Spread Program (STS). Treatment selection criteria used to evaluate each site are: 1) gypsy moth population level, 2) habitat type (urban, rural, open water or wetland), 3) nontarget organisms, 4) safety, and 5) cost and project efficiency.

4.5 Unavoidable Adverse Effects

No unavoidable adverse effects were identified for the proposed project.

4.6 Irreversible and Irretrievable Commitments of Resources

An irreversible commitment of resources results in the permanent loss of: 1) nonrenewable resources, such as minerals or cultural resources; 2) resources that are renewable only over long periods of time, such as soil productivity; or 3) a species (extinction) (USDA 1995, Vol. II, p. 4-93). Except for Alternative 1, there is an irreversible commitment of labor, fossil fuel, and money spent on the project.

An irretrievable commitment is one in which a resource product or use is lost for a period of time while managing for another (USDA 1995, Vol. II, p. 4-93). For this project, no irretrievable commitments were identified.

4.7 Cumulative Effects

Cumulative effects are the incremental impacts of the action when added to past, present, and reasonably foreseeable future actions, which are collectively significant. One of the 17 proposed sites for treatment in 2011 had treatment in the past 5 years (See Table 3).

No cumulative effects were identified for 16 of the 17 proposed sites.

It was determined that possible cumulative effects may occur to nontarget lepidopteran in the Lindenwood 11 site if the proposed acreage at that site was treated again in 2011. 348 acres within this proposed site would have treated with Btk for three years in a row. In addition, another 244 acres within this proposed site would have been treated for two years in a row. The result of this combined area of approximately 592 acres being treated two to three years in a row may have resulted in decreased ability of nontarget lepidopteran to recolonize the site. The Lindenwood 11 site was removed from the proposed project to avoid these possible impacts.

Table 3. Summary of Treatment History of 2011 Proposed Treatment Sites by Year and Treatment Method*.

County	2011 Site Name	Site Treatment History **					2011 Proposed Treatment
		2006	2007	2008	2009	2010	
Adams	Wren	--	--	--	--	--	MD
Allen	Bremer Road 11	--	--	--	--	--	Btk
Allen	Hadley Road 11	--	--	--	--	--	Btk
Allen	Kroemer Road 11	--	--	--	--	--	Btk
Allen	Lindenwood 11	--	--	--	Btk	Btk	Btk
Grant	Upland	--	--	--	--	--	MD
Lake	Highland	--	--	--	--	--	Btk
Lake	Springrose Heath	--	--	--	--	--	Btk
LaPorte/Starke	Bigler	--	--	--	--	--	MD
Marshall	Plymouth	--	--	--	--	--	MD
Marshall	Tamarack Road	--	--	--	--	--	MD
Porter	350 East Core	--	--	--	--	--	Btk
Porter	350 East	--	--	--	--	--	MD
Starke	Koontz Lake	--	--	--	--	--	MD
St. Joseph/Marshall	Walkerton	--	--	--	--	--	MD
Wabash	Mississinewa North	--	--	--	--	--	MD
Wabash/Miami	Mississinewa South	--	--	--	--	--	MD

*Treatment method: Btk = *Bacillus thuringiensis* var. *kurstaki*

MD = Mating disruption

** Indicates previous treatment where there was partial overlap with the 2011 proposed treatment site.

4.8 Other Information

Mitigation

The Cooperative Gypsy Moth Project will implement the following safeguards and mitigating measures:

- News releases of treatments and dates will be given to local newspapers and radio/TV stations.
- Implementation of a Work and Safety Plan.
- Local safety authority will be notified by direct contact or phone calls.
- Prior to treatments, IDNR staff will communicate with private helipads and airports when application aircraft will be flying over treatment sites.
- Employees of state and federal agencies monitoring the treatment will receive training on treatment methods to be able to answer questions from the public.
- Application of Btk will be suspended when school buses are in the site and when children are outside on school grounds.
- Aircraft will be calibrated for accurate application of treatment material.
- Applications will be timed so the most susceptible gypsy moth stage is targeted.
- Weather will be monitored during treatment to assure accurate deposition of the treatment material.
- The wind speeds during the application will be monitored by IDNR personnel and the aerial applicator will maintain the application within the boundaries of the proposed treatment site.

- Treatment will be avoided or stopped if winds are above the guidelines stated in the Work and Safety Plan.
- Aerial treatment in the Highland proposed site in Lake County will be implemented to avoid drift to the Karner blue butterfly area which is northward from the proposed treatment site.
- Locations of known bald eagle wintering and nesting areas within the Mississinewa South proposed site will be obtained from IDNR, Div. of Nature Preserves. Recommended buffer areas will be implemented into aerial flight patterns to minimize disturbance to these areas.
- IDNR, Div. of Entomology and Plant Pathology consulted with IDNR, Div. of Nature Preserves to determine boundaries of the Highland proposed site in Lake County as to avoid adverse impacts on native prairie areas of concern and their associated rare native butterfly and moth species.
- IDNR, Div. of Entomology and Plant Pathology consulted with IDNR, Div. of Nature Preserves to revise treatment boundaries for the 350 East Core proposed site in Porter County as to exclude four areas of concern regarding rare native butterfly and moth species.

Monitoring

During the treatments, ground observers and/or aerial observers will monitor the application for accuracy within the site boundaries, swath width, and drift. Application information (e.g. swath widths, spray-on and spray-off, acres treated, and altitude) will be downloaded to an operations-base computer.

The Btk and mating disruption treatment sites will be monitored using gypsy moth traps to determine the effectiveness of the treatments.

Executive Orders

Executive Order #12898

Consistent with this Executive Order, the USFS considered the potential for disproportionately high and adverse human health or environmental effects on any minority or low-income populations. The proposed treatment sites have been determined based on gypsy moth finds using STS protocols. The proposed treatment itself will have minimal effects, and it will not have disproportionate effects to any minority or low-income population.

5.0 LIST OF PREPARERS

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EA Responsibility: Participated in writing and reviewing the environmental assessment and in the development of the proposed cooperative gypsy moth project.

Experience and Education: Experience as Forest Health Specialist since 1974 and experience in gypsy moth management since 1977. M.F., Duke University in Forest Entomology and Pathology; B.A., Catawba College in Pre-Forestry.

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Experience and Education: Forest entomologist with the USDA Forest Service in St. Paul, MN since 1993. Ph.D., Iowa State University in Entomology and Forest Biology; M.S., University of Arkansas-Fayetteville in Entomology; B.S., Iowa State University in Forestry and Entomology.

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Experience and Education: Nursery Inspector and Compliance Officer with the Indiana Department of Natural Resources, Division of Entomology and Plant Pathology since 1995. B.S., Purdue University in Entomology.

6.0 LIST OF PERSONS AND AGENCIES CONSULTED

John Bacone, Director, IDNR Division of Nature Preserves, 402 West Washington Street, Room W267, Indianapolis, IN 46204. Consultation on native fauna within the proposed project.

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John Castrale, Nongame Bird Biologist, IDNR, Division of Fish and Wildlife, 562 DNR Road, Mitchell, IN 47446. Consultation on bald eagle habitat areas within the proposed project.

Mike Connor, Forest Entomologist, USDA Forest Service, Forest Health Protection, 1992 Folwell Ave., St. Paul, MN 55108. Review of the Environmental Assessment.

James Glass, Director, IDNR Division of Historic Preservation and Archaeology, 402 West Washington Street, Room W274, Indianapolis, IN 46204. Consultation on historical properties of concern.

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Donna Leonard, Entomologist, STS Coordinator, USDA Forest Service, FHP, P.O. Box 2680, Asheville, NC 28802. Consultation on treatment sites.

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Matthew J. Stuber, U.S. Fish and Wildlife Service, East Lansing Field Office, 2651 Coolidge Rd. - Suite 101, East Lansing, MI 48823. Consultation on bald eagle habitat areas within the proposed project.

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